

REMARKS

Favorable reconsideration and allowance of this application are requested.

1. Discussion of Amendment

By way of the amendment instructions above, the pending claims herein have been amended so as to clarify the claimed subject matter and to address the informalities helpfully noted by the Examiner. For example, the claims have been amended so as to clarify that the pigment in the intermediate form of the food product is a substrate for the enzyme and that the at least one enzyme is contacted with the intermediate form of the food product under conditions such that at least a portion of said pigment present in the intermediate form of said food product is converted directly by the at least one enzyme into a form such that the whiteness of at least part of said intermediate form of the food product is increased. Support for such amendments can be found on page 2, lines 16-17 of the original specification. (*"With the term direct is meant that these enzymes act upon the pigment as substrate itself."*)

Claim 10 has been canceled. Claims 11-14 are new and are being presented so as to retain subject matter defined in the originally presented claims. For example, claims 11 and 12 define the preferences originally expressed by claims 2 and 7, respectively. Claims 13 and 14 represent restatements of the subject matter of claim 10, but presented in a manner that is not inconsistent with 35 USC §101.

Following entry of this amendment therefore, claims 1-9 and 11-14 will remain pending herein for which favorable reconsideration and allowance are requested.

2. Response to Claim Objection

The amendment made to claim 8 is believed to render moot the claim objection raised thereagainst.

3. Response to 35 USC §112 Rejection

Claims, 2, 7, 9 and 10 have been amended in a manner believed to address the informalities raised under 35 USC §112, second paragraph.

4. Response to 35 USC §101 Rejection

The originally claimed “use” defined by claim 9 has been recast as a “food product” made by the process of claim 1. Claim 10 has been canceled and replaced with new claims 13 and 14 directed toward a “household detergent” and an “enzymatic stone bleach process”, respectively.

Withdrawal of the 35 USC §101 rejection is therefore in order.

5. Response to Substantive Rejections

One aspect of the present invention which should not be overlooked is that the presently claimed invention involves a novel method for enzymatic bleaching of a food product which method is designed for a direct action on the pigment (i.e. act directly upon the pigment as substrate itself as noted on page 2, lines 16 and 17 of the specification) opposed to the indirect action of, for example, lipoxygenases on a pigment.

A. Claim Rejections – 35 USC §102

Haas (US Patent 1,957,835)

Haas relates to decolorizing of carotin, the yellow pigment found in grains, seeds, plants and other vegetation (page 1, lines 35-37). On page 2 it is described that the bleaching agent used is entirely of vegetable origin and is probably an enzyme or enzyme-like substance (lines 30 and 31). Page 2 further describes that the most

practical source of this enzyme material or bleaching agent is soy-bean (page 2, lines 66-68).

From Haas it is not directly and unambiguously clear that the bleaching agent is an enzyme. However even if one assumes for the sake of argument that Haas describes the use of an enzyme, the disclosure is still silent with regard to one important feature of the presently pending claims. Specifically, as noted briefly above, applicants use an enzyme which has a direct effect on a pigment. This direct pigment effect is not disclosed by Haas. Moreover, it is very likely that the bleaching agent of Haas is a lipoxygenase. As disclosed in the applicants' specification, lipoxygenases from soy bean are used in the baking industry (page 1, lines 16-20). Moreover, this same paragraph makes clear that the bleaching effect of lipoxygenases is an indirect (and not a direct effect) on pigments.

In other words, a lipoxygenase is considered not to act directly on pigments but rather to generate peroxides or radicals that attack pigments *indirectly*.

The presently pending claims are directed to a direct conversion of the pigment by the enzyme. Thus, the claims are novel over Haas.

Sugio et al. (WO 2002/086114)

Sugio et al describe a lipoxygenase from *Magnaporthe salvinii*. As described above, a lipoxygenase has an *indirect* bleaching effect. This is described in Sugio et al. as well. On page 1, lines 6-8 it is described that lipoxygenase uses the oxygenation of polyunsaturated fatty acids and produces hydroperoxides. It is the action of the peroxide which results in bleaching.

On page 9 the sections "Spectrophotometric assay" and "Bleaching assay" make clear that the peroxide reacts on a substrate (in both cases linolenic acid) (i.e. an indirect effect) and not directly on a pigment.

The claims are therefore novel over Sugio et al.

Roos et al. (WO 2005/004616)

Roos et al. describe the bleaching or whitening of a dairy product by using a lipoxygenase.

As outlined above, it should now be clear that lipoxygenase does not have a direct effect on pigments, but instead only an indirect effect.

The claims are therefore likewise novel over Roos et al.

B. Claim Rejections – 35 USC §103

Prior claim 7 attracted are rejection under 35 USC §103(a) as allegedly unpatentable over Sugio in view of Zorn (appl. Microbiol. Biotechnol., 62:331-336, 2003).

The inappropriateness of Sugio et al has been discussed above. The enzyme describe in Sugio is derived from a fungus belonging to *Ascomycetes*.

Zorn describes the testing of 50 filamentous fungi and yeasts for their ability to cleave beta, beta-carotene to flavor compounds.

The whole gist of Zorn is related to flavor development. See for example the disclosures at:

- first sentence of the abstract;
- first sentence of the section "screening procedure", page 333, left column ("flavor compounds");
- final sentence of the section "screening procedure", page 333, right column ("aroma compounds"); and

- the "discussion" section refers at multiple occasions to "aroma" or "flavor compound". See for example the last sentence of this section (a promising tool for aroma compounds)

Zorn does not describe or suggest the use of any of the micro-organisms in food or detergents, let alone to use any of these micro-organisms in a method for obtaining a bleached product.

The examiner seems to take Sugio et al as a starting point for the obviousness rejection under 35 USC §103(a) and states that:

- (i) the degradation of beta-carotene of enzymes derived from *M. scorodinius* (a *Basidiomycete*) appears to be greater and more powerful than enzymes derived from other fungi including an *Ascomycete*; and
- (ii) the enzyme from *Magnaporthe* and the enzyme from *Marasmius* are known functional equivalents

In respect of the first item (i) it is noted that this statement seems to be based on impermissible hindsight. Table 2 shows ONE *Ascomycete* which has a rather poor β,β -carotene degradation percentage. However there is also one bad performing *Basidiomycete* in Table 2. The *Magnaporthe* derived enzyme is not present in Table 2 and hence one cannot conclude that the enzymes of *Marasmius* are more powerful than enzymes obtained from an *Ascomycete* such as *Magnaporthe*. In other words, Table 2 does not provide the motivation to replace the *Magnaporthe* enzyme with a *Marasmius* derived enzyme, because these specific organisms were not directly compared.

In respect of the second item (ii) it is noted that the skilled person would not be motivated to exchange the *Magnaporthe* derived enzyme with a *Marasmius* derived

enzyme, because the *Marasmius* enzyme produces volatile degradation products which might influence the taste and/or smell of treated food products.

Finally it is submitted, contrary to the Examiner's assertion, that the *Magnaporthe* derived enzyme and a *Marasmius* derived enzyme are not known functional equivalents of each other. The *Magnaporthe* enzyme is a lipoxxygenase which has an indirect effect on a pigment and the *Marasmius* derived enzyme has a direct effect on the pigment. Since these enzymes attack different substrates, they most certainly cannot be considered "functional equivalents" of one another.

Pending claim 7 is therefore patentably unobvious over the applied publications.

C. Conclusions

The pending claims are both novel and unobvious over the applied publications of record. Withdrawal of the substantive rejections advanced under 35 USC §§102 and 103 is therefore in order.

6. Information Disclosure Statement

The Examiner's attention is directed to the concurrent filing of a Supplemental Information Disclosure Statement. Consideration of the information cited therein is requested.

MUTSAERS et al
Serial No. 10/584,921
November 30, 2009

7. Fee Authorization

The Commissioner is hereby authorized to charge any deficiency, or credit any overpayment, in the fee(s) filed, or asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Account No. 14-1140.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: /Bryan H. Davidson/
Bryan H. Davidson
Reg. No. 30,251

BHD:dlb
901 North Glebe Road, 11th Floor
Arlington, VA 22203-1808
Telephone: (703) 816-4000
Facsimile: (703) 816-4100